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PROBLEMS FOR SOLUTION.

ARITHMETIC.

71. Proposed by J. C. CALDERHEAD, M. Sc., Professor of Mathematics in Curry University, Pittsburg, Pennsylvania.

A man owes me \$200 due in 2 years, and I owe him \$100 due in 4 years; when can he pay me \$100 to settle the account equitably, money being worth 6%?

72. Proposed by W. H. CARTER, Professor of Mathematics, Centenary College of Louisiana, Jackson, Louisiana.

Though the length of my field is 1-7 longer than my neighbor's, and its quality is 1-9 better, yet as its breadth is 1-4 less, his is worth \$500 more than mine. What is mine worth? *Encyclopedia Britannica.*

73. Proposed by NELSON S. RORAY, South Jersey Institute, Bridgeton, New Jersey.

I would like to change problem 70, Arithmetic, to read as follows and have it proposed for solution:

A owes me \$100 due in 2 years, and I owe him \$200 due in 4 years. When can I pay him \$100 to settle the account equitably, money being worth 6%, and the interest to draw interest until the time of settlement?

Solve by simple arithmetic without the aid of algebraic symbols.

74. Proposed by JOHN T. FAIRCHILD, Principal of Crawfis College, Crawfis College, Ohio.

When U. S. bonds are quoted in London at $108\frac{3}{4}$ and in Philadelphia at $112\frac{1}{4}$, exchange \$4.89 $\frac{1}{4}$, gold quoted at 107, how much more was a \$1000 U. S. bond worth in London than in Philadelphia?

ALGEBRA.

74. Proposed by NELSON S. RORAY, South Jersey Institute, Bridgeton, New Jersey.

Solve according to the conditions given :

$$\sqrt{x+1} + \sqrt{x} = \frac{3}{\sqrt{1+x}}.$$

First, square without transposing and then solve; second, transpose $\sqrt{x+1}$ and then solve. Obtain the same roots as in the first way of solving.

75. Proposed by B. F. BURLESON, Oneida Castle, New York.

Mr. B's farm is in shape a quadrilateral, both inscriptible and circumscribable, and contains an area of $k=10752$ square rods. The square described on the radius of its inscribed circle contains $r^2=2304$ square rods; while the square described on the radius of its circumscribed circle contains an area of $R^2=7345$ square rods. Required the lengths of the sides of his farm.

76. Proposed by E. B. ESCOTT, Fellow in Mathematics, University of Chicago, Chicago, Illinois.

Prove the identities

$$2 - \sqrt{2} = \frac{1}{2} + \frac{1}{2^2 \cdot 3} + \frac{1}{2^3 \cdot 3.17} + \frac{1}{2^4 \cdot 3.17.577} \dots \dots$$

$$\frac{5 - \sqrt{5}}{2} = \frac{1}{1} + \frac{1}{3} + \frac{1}{3.7} + \frac{1}{3.7.47} + \frac{1}{3.7.47.2207} \dots \dots$$

77. Proposed by G. I. HOPKINS, Instructor in Mathematics and Physics in High School, Manchester, New Hampshire.

Solve the equation, $(6x^2 + x - 3)^2 - 48^2 = (x + 15)^2$.

GEOMETRY.

69. Proposed by WILLIAM SYMMONDS, M. A., Professor of Mathematics and Astronomy in Pacific College, Santa Rosa, California; P. O., Sebastopol, California.

To divide a square card into right-lined sections in a manner, that a rectangle of a given breadth can be formed from the sections; likewise, form a square from a rectangular card.

70. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy in Ohio University, Athens, Ohio.

Prove that the locus of the center of the circle which passes through the vertex of a parabola and through its intersections with a normal chord is the parabola $2y^2 = ax - a^2$, the equation to the given parabola being $y^2 = 4ax$.

71. Prove by pure geometry: A perpendicular at the middle point, M_a , of the side BC of the triangle ABC meets the circumcircle in A' . On this perpendicular A'' and A''' are taken so that $M_aA'' = M_aA'$ and $A''A''' = AH$. (H is the orthocenter of triangle ABC). Prove that A''' is on the circumcircle. *Anon.*

72. Proposed by O. W. ANTHONY, M. Sc., Professor of Mathematics, Columbian University, Washington, D. C.

If a line with its extremities upon two curves move in any manner whatever, (the line may vary in length), and P a point upon the line which divides it in the ratio $m:n$ describe a curve, the area of this curve will be given by the formula—

$$A = \frac{(m^2 + nm)A_1 + (n^2 + mn)A_2 - mnA_3}{(m+n)^2}.$$

73. Prove by pure geometry: (1) A' , B' , and C' are the middle points of the arcs BC , CA , and AB respectively. With these points as centers, circles are described passing through B and C , C and A , and A and B respectively. Prove that these circles intersect in O , the center of the incircle of the triangle ABC ; (2), that O , the center of the incircle, is Nagel's point of the triangle formed by joining the middle points of the sides. *Anonymous.*

CALCULUS.

61. Proposed by W. H. CARTER, Professor of Mathematics, Centenary College of Louisiana, Jackson, Louisiana.

If $r = a \sin n\theta$ is the polar equation of a curve, show (1) that the curve consists of n or $2n$ loops according as n is an odd or an even integer; (2) that its area is $\frac{1}{4}$ or $\frac{1}{2}$ of the circumscribing circle according as n is an odd or an even integer.

62. Proposed by A. H. HOLMES, Brunswick, Maine.

A bucket is in the form of a frustum of a cone having its smaller end as a base. It is a inches in diameter at base and b inches in diameter at top, and its perpendicular